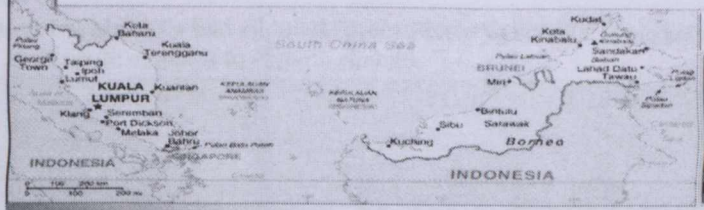
UNIVERSITY OF MALAYA

The Leader in Research & Innovation

The Implication of Feed-In Tariff Funding Structure and the Sustainability of Renewable Energy in Malaysia

Associate Prof. Dr. Sumiani Binti Yusoff/
Ahmad Syafiq Rosli
Faculty of Engineering
University of Malaya
Email: sumiani@um.edu.my

Introduction



MALAYSIA

Population: 30,969,574 (2015) Location:3°08'N 101°42'E
Area: 329,847 km2 Density: 85.8/km^2
GDP per capita (PPP, av) :$16698.76

- In the 1970s, the predominantly mining and agricultural based Malaysian economy began a transition towards a more multi-sector economy. Since the 1980s the industrial sector has led Malaysia's growth, the side-effects of these trends have created a **high energy and resource consuming economy** alongside inevitable environmental degradation.

- With 0.4% of the world's population, Malaysia's 28 million people accounted for 0.6% of the global carbon emissions.

- As a developing country, Malaysia's carbon emissions growth is one of the fastest; it grew by 221% from 1990 to 2004 (UNDP Human Development Report 2007/2008)

Climate Scenarios in Malaysia

Past records:

- Temperature records 1951–1996: warming trend +0.18°C per decade

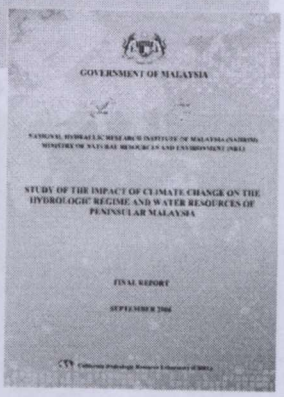
- Rise in sea level over 1986–2006: ~1.3 mm/year (based on 2 pilot sites in Peninsular Malaysia)

Possible climatic change in Peninsular Malaysia by 2041–2050:

- Temperature rise 2°C

- More extreme hydrological conditions
  - ➢Higher maximum rainfall;
  - ➢Lower minimum rainfall.

Source: NAHRIM, 2006


GOVERNMENT OF MALAYSIA

STUDY OF THE IMPACT OF CLIMATE CHANGE ON THE HYDROLOGIC REGIME AND WATER RESOURCES OF PENINSULAR MALAYSIA

FINAL REPORT

3

Malaysia's Response to Climate Change

Over the years, Malaysia had adopted "precautionary principle" policies with actions to mitigate or adapt to climate change.

1.) Ratified United Nations Framework Convention on Climate Change (UNFCCC) on 13 July 1994

2.) National Steering Committee on Climate Change was established in 1994
- To guide national responses on climate change

3.) UNFCCC commitment
- Submitted Initial National Communication (INC) in 2000
- Second National Communication (NC2) 2006-09

4.) Current Policy Scenario
- Cabinet Committee on Climate Change in January 2008 (chaired by Prime Minister)

5.) Formulation of a National Policy on Climate Change (2011)

Climate Change Related Policies in Malaysia

- National Forestry Policy, 1978
- National Energy Policy, 1979
- National Policy on Biological Diversity, 1998
- National Policy on the Environment, 2002
- National Physical Plan, 2006
- National Climate Change Policy, 2011
- National Green Technology Policy, 2011
- National Renewable Energy Policy, 2012

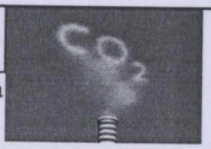
POLICIES ON SUSTAINABILITY

Conference on Climate Change
Conference of the Parties (COP15)
Copenhagen Disccember 2009

Prime Minister of Malaysia on December 2009 at CoP15, announced Malaysia's Commitment to reduced 'Carbon-Intensity' by 40% from base-line year 2005.

	2000	2005	2020	2020 (mitigation)
GDP (RM Billion)	356.401	449.25	906.64	906.64
Emission (MTons CO_2)	223	279	375.5	336.6
Carbon intensity per GDP (CO_2 MTonnes per GDP)	0.63	0.62	0.41	0.37 (40% reduction from 2005 level)

Non-Renewable Energy – CO_2 Emissions



5

1.) **Non**-renewable energy – prime cause of high carbon emissions in Malaysia

2.) **> 95%** of our TPES (Total Primary Energy Supply) are **fossil fuels** (oil, coal and gas)

3.) Major energy consumption sectors – **Transportation** (~40%) and **Industrial** (~40%)

4.) High **CO2 emission intensity of GDP**

– low economy output per unit of energy use

Key sources of GHGs emissions in Malaysia

Rank	*Sub-sector*	*GHGs*	*Emission, CO_2e (mil. mt)*	*Percentage*
1	Emission from energy industries	CO_2	58,486	28.2
2	Transportation	CO_2	35,587	17.3
3	Manufacturing and construction	CO_2	26,104	12.6
4	Landfills	CH_4	24,541	11.8
5	Forest and grassland conversion	CO_2	24,111	11.6
6	Fugitive emissions from fuel	CH_4	21,987	10.60
7	Mineral products	CO_2	9,776	4.7
8	Emission from soil	CO_2	4,638	2.2
9	Commercial	CO_2	2,122	1.0
			207,352	100.0

Development of Energy Policies in Malaysia (MP-3 to MP-10)

National Petroleum Policy 1975

National Energy Policy 1979

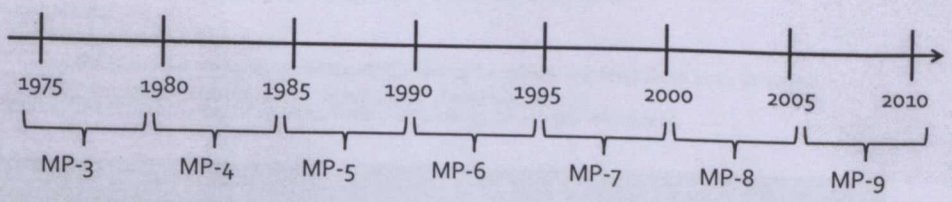
National Depletion Policy 1980

5-Fuel Diversification Policy 2001

4 -Fuel Diversification Policy 1981

1990 Electricity Supply Act

New Energy Policy 2011-2015



1990 Electricity Supply Act

2001 Energy Commission Act

1993 Gas Supply Act

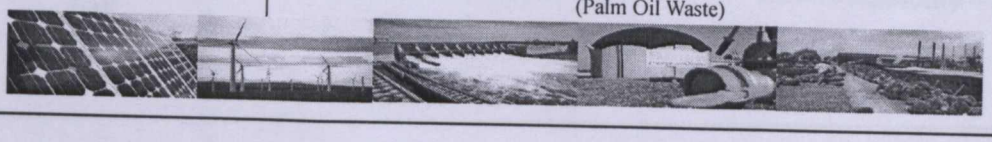
2011 Renewable Energy Act & SEDA Act

Policy evolution toward RE

- **Four Fuel Diversification Policy, 1981 - aims at a balance energy supply mix – oil, gas, coal and hydropower**
- **Five Fuel Diversification Policy, 2001 - further diversify the energy base – renewable energy**
- **National Renewable Energy Policy, 2011 – Intensify the utilization of RE**

Comparison of currently installed and potential capacity of renewable energy

Renewable energy	*Installed Capacity (MW)*	*Potential Capacity (MW)*
Solar	6.2	6500
Wind	0.2	(low potential)
Municipal Solid Waste	-	400
Hydropower	2225 (year 2000)	22 000
Mini-Hydro	23.8	500
Biomass/Biogas	479	1300 (Palm Oil Waste)



National RE Targets

KeTTHA
KEMENTERIAN TENAGA, TEKNOLOGI HIJAU DAN AIR

Year	Cumulative RE Capacity	RE Power Mix (vs. Peak Demand)	Cumulative CO_2 avoided
2010	73 MW	0.5 %	0.3 Mt
2015	985 MW	6 %	11.1 Mt
2020	2080 MW	11 %	42.2 Mt
2030	4000 MW	17 %	145.1 Mt

Notes: RE capacity achievements are dependent on the size of RE fund

Assumptions:

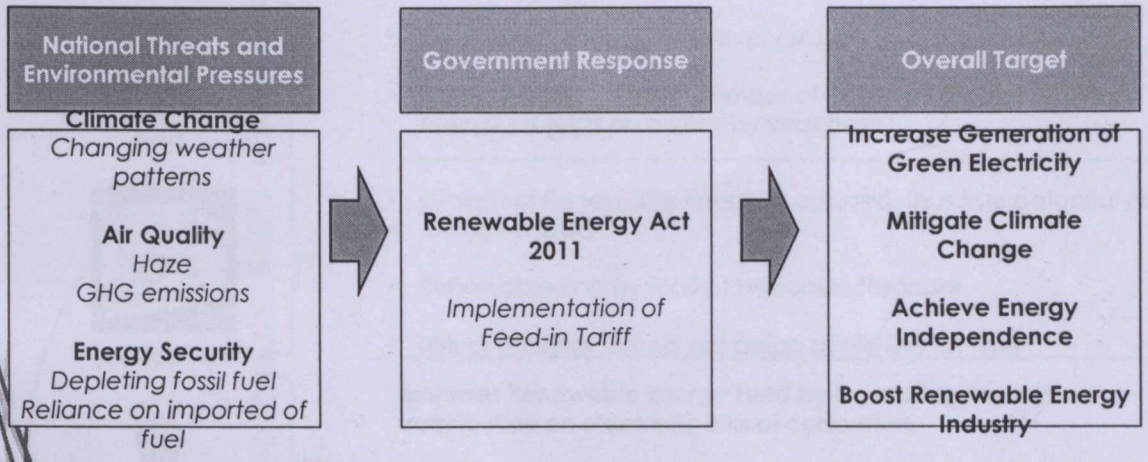
- Feed-in Tariff (FiT) in place
- 15.6% compound annual growth rate (CAGR) of RE power capacity from 2011 to 2030
- CO_2 emission reduction factor of 0.69 t-CO_2/MWh in average

Source: KeTTHA (Ministry of Energy, Green Technology and Water Malaysia)

After only three years of operation, grid-connected RE generating capacity increased from 65 MW to 239 MW

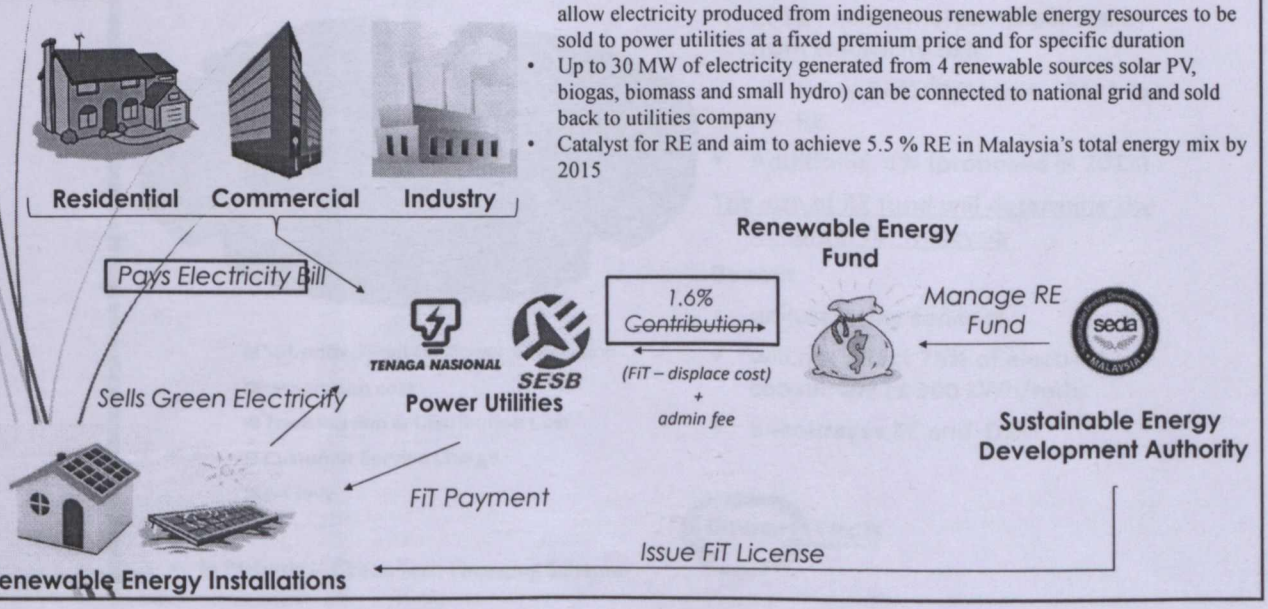
The growth is remarkable given that the SREP program only produced 53MW of grid-connected RE generating capacity after 9 years of operation

Background to the Feed-in Tariff (FiT) Policy



How FiT Mechanism Works (Simplified)

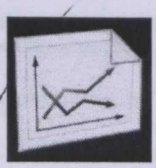
- Under the RE Act 2100 a feed-in tariff (FiT) mechanism has been introduced to allow electricity produced from indigeneous renewable energy resources to be sold to power utilities at a fixed premium price and for specific duration
- Up to 30 MW of electricity generated from 4 renewable sources solar PV, biogas, biomass and small hydro) can be connected to national grid and sold back to utilities company
- Catalyst for RE and aim to achieve 5.5 % RE in Malaysia's total energy mix by 2015



Current Limitations of Feed-in Tariff

Renewable Energy Fund

- Renewable Energy Fund is very small
- **Quota System** limits the number of approval for renewable energy projects on a year-by year basis



Implications

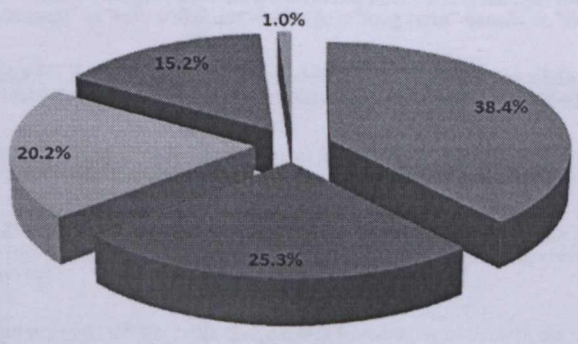
- Growth of Renewable Energy is capped, thus true potential not being realized
- Renewable Energy market becomes stagnant
- Risk of national targets not being achieved on time

Solution

Increase Renewable Energy Fund by increasing the 1.6% contribution on electricity bills of consumers

Policy-makers must know whether electricity consumers (ie. general public) is willing to make a larger contribution to the RE Fund.

Source of funding for Feed-in tariff by SEDA



Source of Funding

- 2011 - additional tariffs collection from electricity bills
  - Every RM100/Month - RM1 for RE
- Additional 1% (proposed in 2013)

The size of RE fund will determine the RE target for Malaysia

Benefit

- polluters pay concept
- will not affect 75% of electricity consumers (≤ 300 kWh/mth)
- encourages EE and DSM

- In Malaysia – Green Tech Financing Scheme

Result & Discussion

FiT in Malaysia

- FiT mechanism = global success
- Most countries follows the German model of FiT
- Malaysia implemented FiT under the Renewable Energy Act 2011
- FiT is legally enforced
- Electricity consumers contribute to the Fund
- To date, installed capacity stands at 298 MW
- Existing literatures agree that FiT is promising but the quota system has cause an RE market stagnation

	European/International	Malaysian
Important Findings	Large segment of population are willing to pay extra for green electricity. Willingness to contribution decrease with higher cost of electricity	NIMBY attitude towards environment Limited study on WTP *Lim & Lam: Malaysian public reluctant to pay extra.
Methodology Comparison	Contingent Valuation Method (CVM) : Putting a price on green electricity	WTP studies based on simple 'yes' or 'no' response

Recommendation: For future WTP studies in Malaysia, use CVM approach to ascertain the price of green electricity (via FiT policy) that the public is willing to accept.

*X.-L. Lim and W.-H. Lam, "Public Acceptance of Marine Renewable Energy in Malaysia," *Energy Policy*, vol. 65, pp. 16-26, 2014.

Challenges of Implementation of Renewable Energy Policy

- Multi-aspects - Involve multiple stakeholders, including public and challenges more on "financial", "technology" "political" factors; "socio economic /awareness" as well and major challenge is "long term" benefit vs. "short term" gain
- Attractiveness of FIT among investors is dependent on the remuneration package which is defined by the cost of the premium tariff at which power utility companies purchase electricity from RE producers - collective payment vehicle or 'green levies'
- Bigger FIT schemes can potentially result in hikes in electricity price to cover the FIT operating cost eg uncapped FIT scheme in Italy had caused a boom in the PV market, scheme had caused a financial burden which exceed 7 billion euros over the next 20 years
- Malaysia introduced a quota system which is a cap in the FIT scheme based on the availability of the Renewable Energy Fund where the RE Fund is the money collected from electricity consumers to fund the FIT operation in Malaysia and only a limited number of RE projects are approved each year.
- A quota system prevents a fiscal crisis under the FIT mechanism, however, the quota system can also act as a barrier to the achievable RE capacities. Such quota mechanism prevents the RE market from booming out of control which may result in a fiscal crisis that is ultimately paid by electricity consumers in form of electricity price hikes
- A case study on Switzerland's RE growth from 2010 onwards and he claims that Switzerland's capping system had placed more than half of potential RE projects on the waiting list which accumulates to more than 3000 MW of RE capacities.
- Recently, Malaysia has encountered the same problem as the RE Fund is too small to meet demand for PV projects. In 2011, the quota for small scale PV projects was filled up within two hours of the opening. Moreover, SEDA announced on 12th September 2014 that there will be no PV quota allocated for households for 2015 due to the overwhelming response for household PV projects in 2014

Public Acceptance Of Feed-in Tariff And Willingness To Pay

- Small size of the RE fund has threatened to stagnate the RE market
- Electricity consumers using more than 300kw per month are being charged 1.6% levy to their electricity bill
- In 2014, the RE Fund collected by SEDA accumulated to more than Rm 600 million from the levy, however, the RE Fund is still unable to meet the demand
- 1.6% RE levy must increase, but requires parliamentary approval
- Challenge for policy-makers is to increase the fund for FIT operations via an increase in levy or by alternative means
- Public acceptance and willingness to pay is the key

International Comparison on Public Attitude Towards Environment

- There is a linear relationship between a person's environmental awareness and environmental behaviors
- Values and awareness would influence an individual's willingness to pay for green electricity
- NIMBY attitude towards wind energy in Europe is more prevalent in populations residing near wind farms. Yet, a study conducted on wind farms in Sweden does not support the NIMBY hypothesis
- While the prevailing public attitude towards the environment in European countries are not straight forward, the situation is less complex in Malaysia.
- Several literatures suggested that the NIMBY approach toward the environment has been the predominant attitude among the Malaysian public
- Malaysian public do have a moderate to high level of awareness on environmental issues. Yet, the public scored low on environmental attitude and behavior, however high awareness does not necessarily translate to active participation
- A survey indicated that 82.8% of respondents supported renewable energy but 56% of them are reluctant to pay for green electricity
- A preliminary study found that 56.8% of Malaysians are reluctant to pay for green electricity
- Malaysians are not willing to invest in green electricity via FIT scheme by investing in solar panels due to high upfront installation cost

International Comparison on Willingness to Pay for Green Electricity

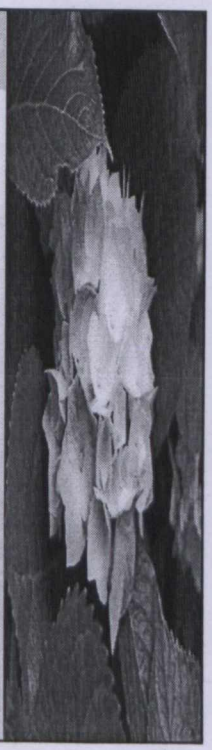
- probability of paying extra for green electricity is greater for individuals with higher income which amounts to 16.6% extra
- WTP increases with positive attitude towards green electricity with 66% of households willing to pay an extra 0.2 Swedish Krona per kWh
- In the United States, public opinions hold that collective payment method whereby all members of the public must contribute is not perceived to be necessary
- Individual's stated interest to pay more for green electricity should be treated with caution since WTP response are often inflated and does not materialize in real practice

Contingent Valuation Method

- Contingent valuation method (CVM) is used in many studies that intends to put a price on a particular environmental service.
- CVM based literatures in Malaysia has been extensively conducted in the field of eco-product valuation
- Well-structured WTP question requires a spectrum of response since previous research has shown that individuals are often willing to contribute up to a certain range
- It is recommended that future studies on WTP in Malaysia follows the CVM approach

Conclusion

- Malaysia acknowledges the threat arising from climate change and resource depletion where energy policy was constantly revised over time in order to address new issues that pose a threat towards the nation's energy security
- The pro-environmental energy policies under the Eighth and Ninth Malaysia Plan failed to meet its objectives
- A radical new policy mechanism was needed and many literatures supported the notion that the FIT scheme is proven to be successful globally. Although still in its infancy, preliminary results suggest that FIT is making an impact in Malaysia.
- At present, the RE Fund is insufficient to meet the demands for RE project under the FIT scheme
- Parliament needs to amend the law which allows an increase to the 1.6% contribution from electricity consumers.
- However, such move is likely to result in public resistance if it is not handled properly. Yet, studies conducted on analyzing the financial sustainability of the FIT scheme is still lacking.
- This research gap needs to be filled in order to help policy-makers amend the RE law based on factual evidence, and thereby providing the public with the necessary justification to change the 1.6% contribution. CVM approach study is to be conducted for an appropriate economic valuation for green electricity in Malaysia to be established credibly



Thank You for Your Kind Attention